Chapter 1
Introduction

1-1. Purpose

This ETL provides guidance for conducting hydrologic engineering analyses for interior areas. The Hydrologic Engineering Center Interior Flood Hydrology (HEC-IFH) program is used as the primary tool for analyzing interior flooding. This document is intended to assist with better scoping, planning, and analysis of interior flooding studies using the HEC-IFH program. The information and analysis strategies presented are consistent with present guidance, specifically, ER 1105-2-100, EM 1110-2-1413, EC 1105-2-205, and procedures described in the HEC-IFH Package User's Manual (USACE 1992).

1-2. Overview of Interior Flood Hydrology Concepts

a. An interior area is defined as the area protected by a line-of-protection from direct river, lake, or tidal flooding. Interior areas may also include low depressions and natural sinks. Figure 1-1 is a conceptual illustration of an interior area. The following paragraphs describing interior flooding are taken from EM 1110-2-1413.

b. The levee, floodwall, or seawall associated with an interior area is called the line-of-protection. The line-of-protection excludes flood water originating from the exterior source but often aggravates the problem of interior flooding by blocking natural flow paths or outlets. Protected interior areas, formerly flooded from the exterior source by slowly rising flood waters generated from regional storms, may now flood from rainfall events that are more localized, occur more suddenly, and provide less warning. For example, flooding from the Mississippi River can be forecast several days in advance, but flooding from a localized storm on a protected interior area may occur in several hours or less. The flooding may be aggravated by coincident high exterior stages. The interior flooding that results usually may be of the nuisance variety (shallow, temporary flooding), but sometimes it can be more dangerous than the situation without the levee.

c. Interior flood waters are normally passed through the line-of-protection by gravity outlets when the interior water levels are higher than water levels of the exterior. This is called a positive gravity condition. When exterior stages are higher than the interior, flood waters are stored and/or diverted and pumped over or through the line-of-protection. This condition is known as a blocked gravity condition and is illustrated in Figure 1-2.

d. Gravity outlets, pumping stations, interior detention storage basins, diversions, and pressure conduits reduce flood damage within interior areas. Other measures, such as hillside reservoirs, channels, floodproofing, relocations, regulatory policies, and flood warning preparedness actions, may also be integral elements of interior systems.

e. Interior areas are studied to determine the specific nature of flooding and to formulate alternatives that reduce the residual and/or induced flooding. The objectives are the same

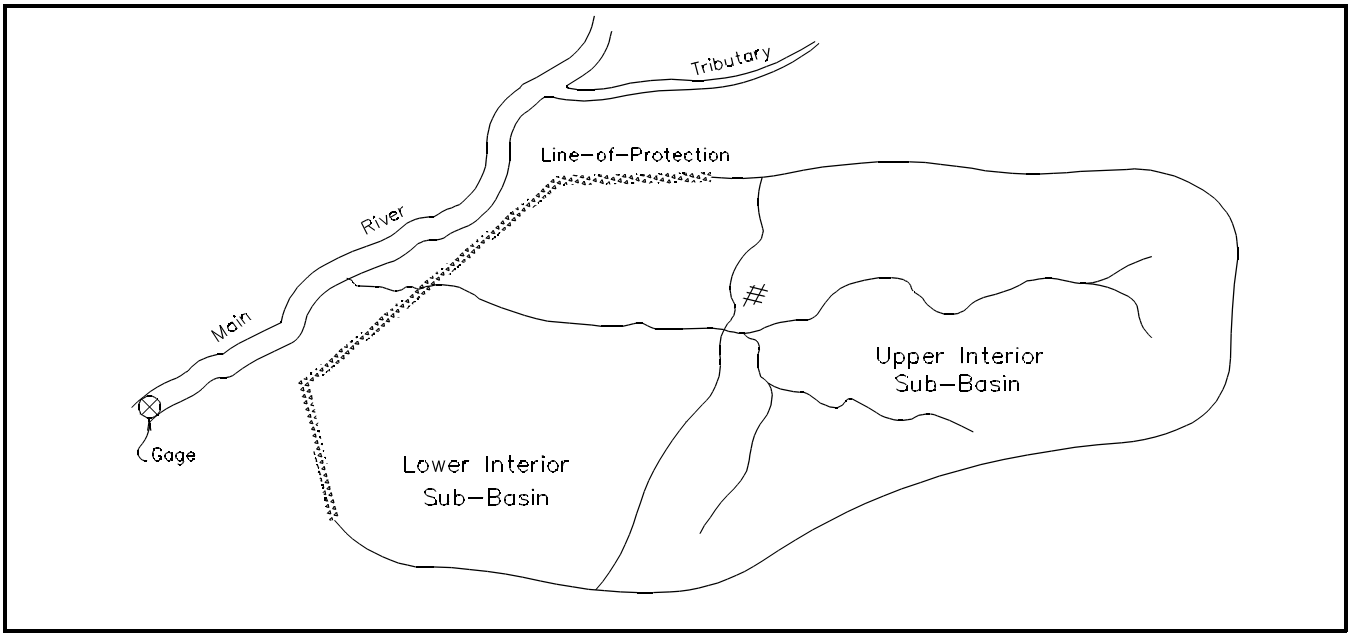

Figure 1-1. Typical interior area

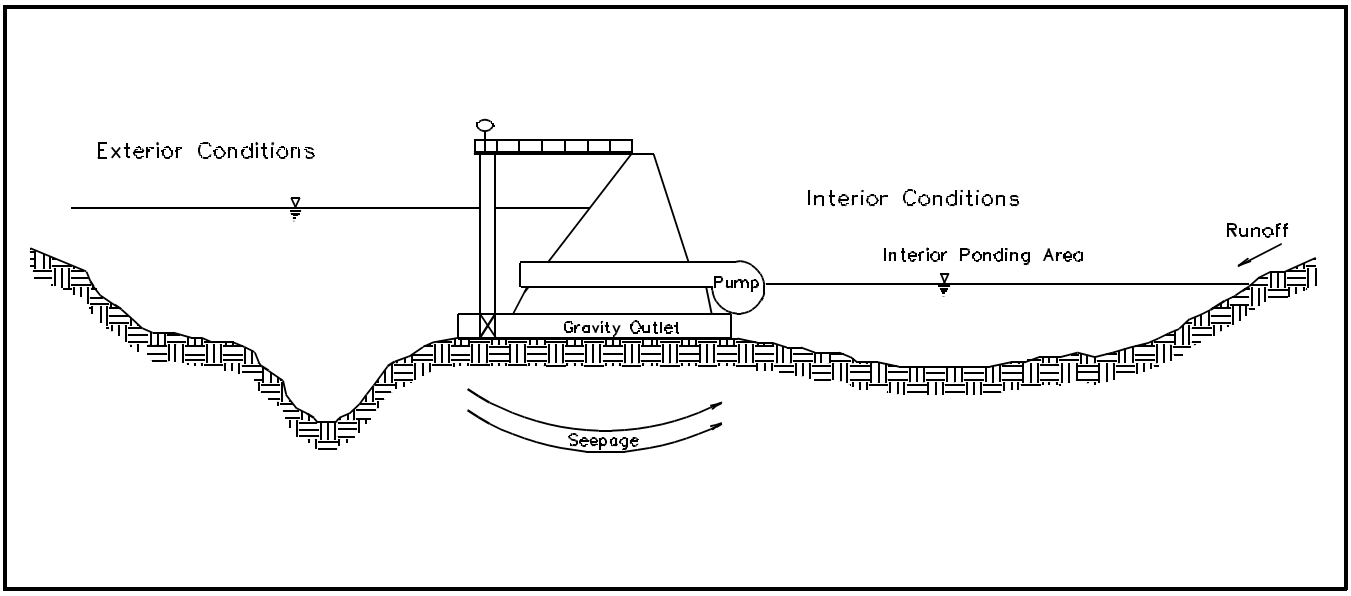

Figure 1-2. Cross section of typical interior system

as any flood reduction measure: to strengthen the national economy, enhance the environment, promote social well-being, and foster regional development. The plan selected for implementation is the one that best meets these objectives.

f. Hydrologic analysis of interior areas is complex and often difficult. Records may be scant or nonexistent, land use (and thus runoff) may have changed and is often continuing to change, natural flow paths are altered, and coincident flooding is the common situation (coincident flooding is discussed in paragraphs 2-6 and 2-7). Interior areas are generally flat and small (less than 2.59 sq km or 10 sq miles) and the measures to be considered are numerous, making the analysis tedious. The HEC-IFH program makes the technically complex problem of interior flooding easier to analyze.

g. Interior area investigations are different from other studies by hydrologic analysis factors and the uniqueness of commonly implemented flood damage reduction measures. But the study process and types of studies conducted to plan and design flood damage reduction actions are identical to those of other Corps investigations. Interior area analysis must follow current federal planning and design policies and regulations. Analysis includes formulation and evaluation procedures, level of protection considerations, and hydrologic, economic, environmental, and social assessment criteria.

h. Interior area planning studies are an essential aspect of feasibility studies. Although facilities and costs may at times be small components of a major line-of-protection project, the elements are often major items in the negotiated local sponsor agreements. They can represent a significant proportion of local costs, especially operation and maintenance costs.

1-3. Organization of Document

a. This document follows the technical steps necessary to successfully conduct a flood damage reduction analysis for interior areas. Hydrologic engineering aspects, data collection requirements, and evaluation of a minimum interior facility for interior areas are discussed. HEC-IFH modular concepts, data input procedures, and evaluation of with- and without-project conditions are also discussed. The main document provides information on:

(1) Study strategy.

(2) General analysis procedures when beginning an interior analysis.

(3) Concepts and applications of the HEC-IFH program.

(4) Preliminary investigations of the study area and data assembly.

(5) Analysis of existing and future without-project conditions for evaluating a minimum facility evaluation.

(6) Analysis of interior flood damage reduction measures to determine the appropriate gravity outlet, pumping and detention storage capacity.

(7) Comparison and evaluation of plans.

b. The HEC-IFH output summaries, data modules, and plotting capabilities of the program satisfy many reporting requirements. Appendices include references, a glossary of terms, a detailed work plan example, and two case studies that exemplify the use of HEC-IFH in a study setting.

1-4. Program Documentation

The primary documentation for the HEC-IFH program is the user's manual: a comprehensive description of the HEC-IFH program capabilities, theoretical basis for computations, and example problems illustrating data input and output. The user's manual should be carefully reviewed before using the computer program.